PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
Cal 85908		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 03/02636	12.03.2003	20.03.2002
International Patent Classification (IPC) or both national classification and IPC		
C08F255/00		
Applicant		
POLIMERI EUROPA S.P.A.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
26.08.2003	16.03.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Boletti, C Telephone No. +49 89 2399-8527

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/02636

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-10 as originally filed

Claims, Numbers

1-16 received on 13.02.2004 with letter of 11.02.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-16
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations

see separate sheet

None of the prior art citations discloses nor suggests the combination of the specific embodiments as claimed in the present application in order to provide functionalised polyolefins showing reduced cross linking phenomena of the substrate. Furthermore, the present process permits an effectively control of the molecular weight or the formation of microgels and branchings of the polyefins.

In particular, D1- D7 do not expressly operate under high shear conditions. None of them, except D3, are concerned with EPM or EPDM. Only D4 refers to maleic anhydride or its derivatives. None of those citations is directed to solution of the present application.

Therefore, the subject-matter of the claims is novel and inventive under art. 33 ("9 and (3) PCT.

CLAIMS

1. A process for the functionalisation of polyolefins selected from:

   - ethylene/propylene copolymers (EPM) with a molar propylene content ranging from 16% to 50%, and an Mw ranging from 10,000 to 200,000;
   - ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers with a molar ethylene content ranging from 40 to 85%, from 15 to 70% of propylene and 2 to 10% molar of non-conjugated diene, the molecular weights Mw of the EPDM being within the range from 75,000 to 450,000;

   which comprise the treatment under shear conditions higher than 100 sec^{-1}, with a polar unsaturated monomer selected from maleic anhydride and its derivatives, in the presence of at least one hydroperoxide as radicalic initiator, the concentration of hydroperoxide with respect to the polyolefins ranging from 0.1 to 20% by weight.

2. The process according to claim 1, wherein the shear conditions are higher than 1000 sec^{-1}.

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3. The process according to claim 1, wherein the ethylene/propylene (EPM) copolymers have a molar propylene content ranging from 20% to 45%.

4. The process according to claim 1, wherein the ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers have a molar ethylene content ranging from 40 to 70%, from 30 to 60% of propylene and from 0.5 to 20% of non-conjugated diene.

5. The process according to claim 4, wherein the ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers have a molar content of non-conjugated diene ranging from 1 to 15% molar.

6. The process according to claim 5, wherein the ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers have a molar content of non-conjugated diene ranging from 2 to 10% molar.

7. The process according to claim 4, wherein the ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers have a molecular weight Mw ranging from 100,000 to 180,000.

8. The process according to claim 1, wherein the non-conjugated diolefins are selected from 1,4-hexadiene, 1,5-heptadiene, 1,6-octadiene, 1,4-cyclohexadiene, 5-methylene-2-norbornene, 5-ethylidene-2-norbornene.

9. The process according to claim 8, wherein the non-

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conjugated diolefin is 5-ethylidene-2-norbornene.

10. The process according to claim 1, wherein the hydroperoxide is selected from cumene hydroperoxide, hydrogen peroxide, t-butyl hydroperoxide, 2,5-dihydroperoxy-2,5-dimethyl hexane.

~~12. The process according to claim 1, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.1 to 20% by weight.~~

11. The process according to claim 1, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.2 to 10% by weight.

12. The process according to claim 11, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.5% to 5% by weight.

~~15. The process according to claim 1, wherein the polar unsaturated monomers are selected from unsaturated carboxylic acids such as esters, amides, acids, metallic salts of acrylic acid, fumaric acid, itaconic acid, citraconic acid and maleic acid, maleic anhydride, esters of vinyl alcohol, vinyl silane derivatives, vinyl imidazole derivatives, vinyl oxazole derivatives, vinyl pyridine derivatives.~~

16. The process according to claim 15, wherein the polar unsaturated monomers are selected from maleic anhydride and its derivatives.

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~~17~~. The process according to claim 1, wherein the quantity of polar unsaturated monomers ranges from 0.1 to 10% with respect to the polyolefins.

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~~18~~. The process according to claim ~~17~~, wherein the quantity of polar unsaturated monomers ranges from 0.4 to 1.5% with respect to the polyolefins.

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~~19~~. The process according to claim 1, carried out at a temperature ranging from 80 to 250°C, for a time ranging from 1 to 1800 seconds.

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~~20~~. The process according to claim ~~19~~, wherein the temperature ranges from 140 to 200°C and the time ranges from 30 to 600 seconds.

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